

## CLAIMS

What is claimed is:

- 1           1.     A circuit board assembly, comprising:
  - 2           a.     a circuit board;
  - 3           b.     an integrated circuit package having a substrate with an array of solder  
4 columns extending from a bottom surface of the substrate to the circuit board when  
5 the integrated circuit package is mounted on the circuit board; and
  - 6           c.     at least one support member affixed to at least one of a side of the  
7 substrate and a top surface of the substrate when the integrated circuit package is  
8 mounted to the circuit board.
- 1           2.     The apparatus of claim 1 wherein the support member is affixed to the  
2 integrated circuit package after the integrated circuit package is mounted to the  
3 circuit board by adhesive, the adhesive accommodating any variation in height of the  
4 integrated circuit package.
- 1           3.     The apparatus of claim 2 wherein the integrated circuit package has a  
2 lid affixed to the substrate, the lid having an outer perimeter that is smaller than an  
3 outer perimeter of the substrate, each support member having a flange extending  
4 over the upper surface of the substrate, the flange of each support member affixed to  
5 at least one of the outer edges of the lid and the upper surface of the substrate by  
6 adhesive.

1           4.     The apparatus of claim 3 wherein the support member comprises a  
2 frame surrounding the integrated circuit package.

1           5.     The apparatus of claim 4 wherein the frame is rectangular and has a  
2 support leg and an inwardly extending flange at each corner, each support leg  
3 having first and second segments approximately at right angles to each other and  
4 each flange having first and second segments at approximately right angles to each  
5 other, each flange secured to at least one of the outer edge of the lid and the upper  
6 surface of the substrate by adhesive.

1           6.     The apparatus of claim 7 wherein the flanges are secured to both the  
2 outer edge of the package lid and the upper surface of the substrate by adhesive.

1           7.     The apparatus of claim 3 wherein the integrated circuit package is a  
2 column grid array integrated circuit package.

1           8.     The apparatus of claim 2 wherein the support member comprises a  
2 frame surrounding the integrated circuit package with an inner side of the frame  
3 affixed by adhesive to at least one of an outer side of the substrate and an outer  
4 edge of a lid affixed to the substrate, the adhesive accommodating any variation in  
5 height of the integrated circuit package.

1           9.     The apparatus of claim 2 wherein the support member comprises a  
2 support leg.

1           10.    The apparatus of claim 9, wherein the integrated circuit package has a  
2 lid affixed to the substrate, the lid having an outer perimeter that is smaller than an  
3 outer perimeter of the substrate, each support leg having a flange extending over an  
4 upper surface of the substrate, each flange affixed to at least one of an outer edge of  
5 the lid and the upper surface of the substrate by adhesive, the adhesive  
6 accommodating any variation in height of the integrated circuit package.

1           11.    The apparatus of claim 9 wherein the integrated circuit package is  
2 rectangular and has a support leg at each corner.

1           12.    The apparatus of claim 11, wherein each support leg is affixed to at  
2 least one of an outer edge of a lid affixed to the substrate and an outer edge of the  
3 substrate by adhesive, the adhesive accommodating any variation in height of the  
4 integrated circuit package.

1           13.    The apparatus of claim 10 wherein the integrated circuit package is a  
2 column grid array integrated circuit package.

1 14. A circuit board assembly, comprising:

2 a. a circuit board;

3 b. a column grid array integrated circuit package having a substrate with  
4 an array of solder columns extending from a bottom surface of the substrate to the  
5 circuit board when the integrated circuit package is mounted on the circuit board, the  
6 integrated circuit package having a lid affixed to the substrate, the lid having an outer  
7 perimeter that is smaller than an outer perimeter of the substrate; and

8 c. at least one support member affixed to at least one of an edge of the lid  
9 and a top surface of the substrate by adhesive after the column grid array integrated  
10 circuit package has been mounted to the circuit board, the adhesive accommodating  
11 any variation in height of the column grid array integrated circuit package.

1 15. The apparatus of claim 14, wherein each support member has a flange  
2 extending over the upper surface of the substrate, the flange of each support  
3 member affixed to at least one of the outer edge of the lid and the upper surface of  
4 the substrate by adhesive.

1 16. The apparatus of claim 15 wherein the column grid array integrated  
2 circuit package is rectangular and the support member comprises a rectangular  
3 frame extending around the substrate, the frame having a support leg and an  
4 inwardly extending flange at each corner, each support leg having first and second  
5 segments approximately at right angles to each other and each flange having first  
6 and second segments at approximately right angles to each other, each flange  
7 secured to at least one of the outer edge of the lid and the upper surface of the  
8 substrate by adhesive.

1           17. In a circuit board assembly having a circuit board and an integrated  
2 circuit package, the integrated circuit package having a substrate with an array of  
3 solder columns extending from a bottom surface of the substrate to the circuit board,  
4 a method of supporting the integrated circuit package against compressive force,  
5 comprising the step of affixing at least one support member to at least one of a side  
6 and a top of the substrate after the integrated circuit package has been mounted on  
7 the circuit board, the support member having at least a portion that extends from the  
8 substrate to the circuit board.

1           18. The method of claim 17 wherein the step of affixing the at least one  
2 support member includes providing a support member having flanges that extend  
3 over a portion of a top of the substrate when the support member is affixed to the at  
4 least one of the side and top of the substrate and affixing the flanges to the top of the  
5 substrate by adhesive, the adhesive accommodating any variation in height of the  
6 integrated circuit package.

1           19. The method of claim 17 wherein the step of providing the support  
2 member includes providing a support member comprising a frame that extends  
3 around the substrate and affixing the frame affixed to the substrate by adhesive, the  
4 adhesive accommodating any variation in height of the integrated circuit package.

1           20.    The method of claim 17 wherein the step of affixing the at least one  
2 support member includes providing at least one support member comprising a  
3 support leg and affixing the support leg to the integrated circuit package by adhesive,  
4 the adhesive accommodating any variation in height of the integrated circuit  
5 package.

1           21.    The method of claim 20 wherein the step of providing at least one  
2 support member comprises providing at least four support members spaced  
3 equidistantly around a periphery of the substrate.